

5 Bicycle Lanes



Bicycle lanes are portions of the roadway designated exclusively or primarily for bicycles.

Introduction

Bicycle lanes may be considered when it is desirable to delineate available road space for preferential use by bicyclists and motorists. Bicycle lanes should always be one-way facilities and carry traffic in the same direction as adjacent motor vehicle traffic. Two-way bicycle lanes on one side of the roadway are unacceptable because they promote riding against the flow of motor vehicle traffic. Wrong-way riding is a major cause of bicycle accidents and violates the rules of the road stated in the *Motor Vehicle Laws of North Carolina*. Bicycle lanes on one-way streets should be on the right side of the street, except in areas where a bicycle lane on the left will decrease the number of conflicts (e.g., those caused by heavy bus traffic).

While there are no universally accepted objective criteria for determining the need for bicycle lanes, the following factors are important considerations.

Bicycling demand: Simply striping bicycle lanes will not necessarily create bicycle use. Surveys in several cities with active bicycle programs have shown that bike lanes attract exist-

ing users to a particular street but do not necessarily attract new bicyclists.

Potential origins and destinations: In order to attract bicyclists, there must be a nearby population of likely users and potential destinations within riding distance. According to most surveys, a 6 km (4 mi) radius defines the maximum bicycle trip for most casual users.

Available alternatives: When considering alternate routes for bicycle lane installation, the designer must remember that most bicyclists will choose the route that best combines direct access with low traffic volumes.

Surrounding land use: Strip development or other areas with many commercial or institutional driveways and, therefore, significant volumes of right-turning traffic, tend to make unsuitable locations for bicycle lanes. In such cases, wide curb lanes may be more appropriate.

Traffic conditions: High volume multi-lane highways with numerous grade separated interchanges, or multi-lane roadways with continuous center-turn lanes and high volumes

of motor vehicles make less suitable roads for bicycle lanes. In such cases, bicycle lanes can attract novice or child bicyclists to a potentially hazardous situation.

Geometric conditions: Adequate pavement surface, bicycle-safe grate inlets, safe railroad crossings and traffic signals responsive to bicycles should always be provided on roadways where bicycle lanes are being designated. Generally, roads with many complicated intersections (e.g., those with multiple right turn lanes) are more difficult locations to modify for inclusion of bicycle lanes. In these situations, wide curb lanes should be the preferred option for accommodating bicyclists.

Other considerations: Bicycle lanes are not advisable on long, downgrades of 4 percent or more, where bicycle speeds greater than 48 km/h (30 mph) are expected. As grades increase, downhill bicycle speeds will increase, which increases the problem of riding near the edge of the roadway. In such situations, bicycle speeds can approach those of motor vehicles, and experienced bicyclists will generally move into the traffic lanes to increase sight distance and maneuverability. If bike lanes are to be striped, additional width should be provided to accommodate higher bicycle speeds.

Striping bike lanes next to curbs where parking is prohibited only during certain hours must be done only in conjunction with special signing to designate the hours bike lanes are to be effective. This type of bike lane should be considered only if the vast majority of bicycle travel would occur during the hours of the park-

ing prohibition, and only if there is a firm commitment to enforce the parking prohibition. Because of the obvious complications, this type of bike lane is not encouraged for general application.

Figure 5-1 gives several other cautions taken from the Federal Highway Administration's *Safety and Locational Criteria for Bicycle Facilities*.

Bicycle lane delineation

Bicycle lane lines should be solid, 100 mm to 150 mm (4 in to 6 in) wide, and marked with white traffic paint. The width of the lines should match the width of other lines on the particular roadway in question. Thermoplastic and preformed tape can be slippery when wet, causing loss of control for bicyclists, and should, therefore, not be used.

Raised barriers (e.g., raised traffic bars and asphalt concrete dikes) or raised pavement markers should not be used to delineate bicycle lanes. Raised barriers prevent motorists from merging into bike lanes before making right turns, restrict the movement of bicyclists desiring to enter or exit bike lanes and impede routine maintenance.

Bike lane markings should be placed a constant distance from the outside motor vehicle lane. Bike lanes with parking permitted should not be directed toward the curb at intersections or localized areas where parking is prohibited. Such a practice prevents bicyclists from following a straight course. Where transitions from one type of bike lane to another are necessary, smooth tapers should be provided. (See the MUTCD, Section 3B-8 for taper design.)

Principal problems with bike lane applications

- Provision of inadequate lane width or use of unrideable street surface as the bike lane area;
- Abrupt termination of lanes at hazard or constraint situations, creating a facility which leads bicyclists to a trap; also transitions which force awkward bicyclist movements at other termination points;
- Use of non-standard and poorly visible lane demarkation signs and markings which create uncertainties in motorist and bicyclist understanding of lane presence and purpose;
- Lane configuration and lane use ordinances which prevent the bicyclist from establishing proper position with respect to motor vehicle traffic at intersections as well as for mid-block turns into driveways; and
- Lane use ordinances which conflict with reasonable bicyclist desires to leave the lane in order

Bicycle lane surface quality

Bicycle lanes should be paved to the same standards as adjacent traffic lanes. The surface to be used by bicyclists should be smooth, free of potholes, and the pavement edge uniform. For rideability on new construction, the finished surface of bikeways should be smooth and true to the required cross section and grade. The surface should conform to the *NCDOT Standard Specifications for Roads and Structures*, Section 610-13, Surface Requirements. Further, manholes, drainage grates and utility covers should be located outside the bicycle lane. For more advice on pavement quality, see Chapter 4.

Bicycle lane widths

Under ideal conditions, minimum bicycle lane width is 1.2 m (4 ft). However, certain edge conditions dictate additional desirable bicycle lane width. Additional width also is desirable when the width of the adjacent traffic lane is less than 3.6 m (12 ft). This is an important addition because the effective clearance between a bicyclist and adjacent traffic is a function of the combined width of both the bike lane and the adjacent traffic lane.

To examine the width requirements for bicycle lanes, Figure 5.2 shows four usual locations for such facilities in relation to the roadway. Figure 5.2 (1) depicts bicycle lanes on an urban curbed street where a parking lane is provided. The minimum bicycle lane width for this location is 1.5 m (5 ft). Bicycle lanes should always be placed between the parking lane and the motor vehicle lanes. Bicycle lanes between the curb and the parking lane create hazards for bicyclists from opening car doors and poor visibility at intersections and driveways. They also prohibit bicyclists from making left turns; therefore, this placement should never be considered.

Where parking is permitted but a parking lane is not provided, the combination lane, intended for both motor vehicle parking and bicycle use, should be a minimum of 3.6 m (12 ft) wide. Figure 5-2 illustrates this condition. However, if it is likely the combination will be used as an additional motor vehicle lane, it is preferable to designate separate parking and bicycle lanes, as shown in Figure 5-2 (1). In both instances, if parking volume is substantial or

turnover is high, an additional 0.3 m to 0.6 m (1 ft or 2 ft) width is desirable for safe bicycle operation.

Figure 5-2 (3) depicts bicycle lanes along the outer portions of an urban-type curbed street where parking is prohibited. Bicyclists do not generally ride near a curb because of the possibilities of riding through debris, over an uneven longitudinal joint, or along a steep cross-slope, or of hitting a pedal on the curb. Bicycle lanes in this location should have a minimum width of six feet from the curb face.

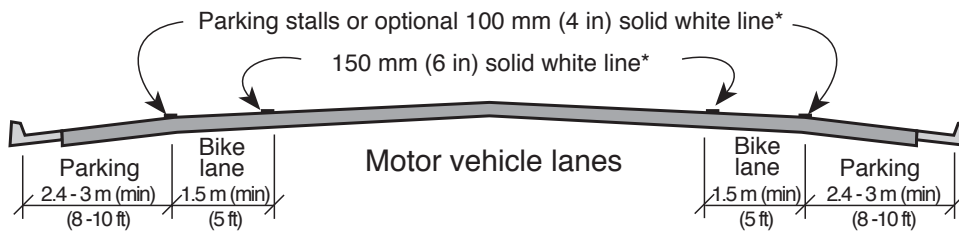
Figure 5-2 (4) depicts bicycle lanes on a highway without curb or gutter. Bicycle lanes should be located between the motor vehicle lanes and unpaved shoulders. Bicycle lanes may have a minimum width of 1.2 m (4 ft), although a width of 1.5 m (5 ft) or greater is preferable. Additional width is desirable where substantial truck traffic is present, where prevailing winds are a factor, on grades, or where motor vehicle speeds exceed 56 km/h (35 mph).

Bicycle lane intersection design

Bicycle lanes tend to complicate both bicycle and motor vehicle turning movements at intersections. Because they encourage bicyclists to keep to the right and motorists to keep to the left, both operators are somewhat discouraged from merging in advance of turns. Thus, some bicyclists will begin left turns from the right side bicycle lane and some motorists will begin right turns from the lane to the left of the bicycle lane. Both maneuvers are contrary to established rules of the road and result in conflicts. Common movements of motorists and bicyclists are shown in Figure 5-3.

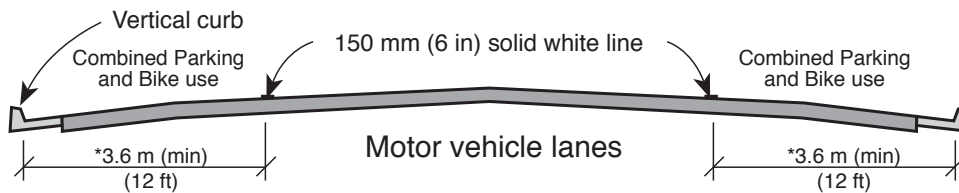
At intersections, bicyclists proceeding straight through and motorists turning right must cross paths. Marking and signing configurations which encourage these crossings through merging in advance of the intersection are generally preferable to those that force the crossing in the immediate vicinity of the intersection. To a lesser extent, the same is true for left-turning bicyclists. However, in this maneuver, the rules of the road allow bicyclists to make either a “vehicular style” left turn (where the bicyclist merges left to the same lane used for motor vehicle left turns) or a “pedestrian style” left turn

(1) Marked parking and bike lanes



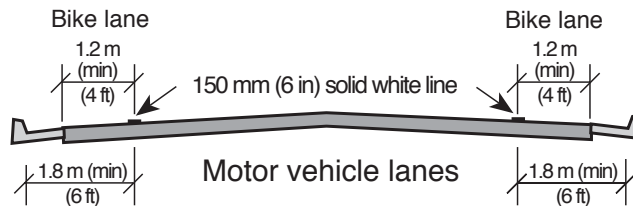
* The optional solid white stripe may be advisable where stalls are unnecessary (because parking is light) but there is concern that motorists may misconstrue the bike lane to be a traffic lane.

(2) Combined parking and bike use



* 3.9 m (13 ft) is recommended where there is substantial parking or turnover of parked cars is high (e.g., commercial areas).

(3) Parking prohibited



(4) Typical roadway in outlying areas parking restricted

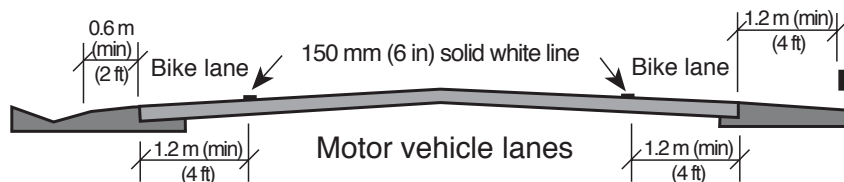
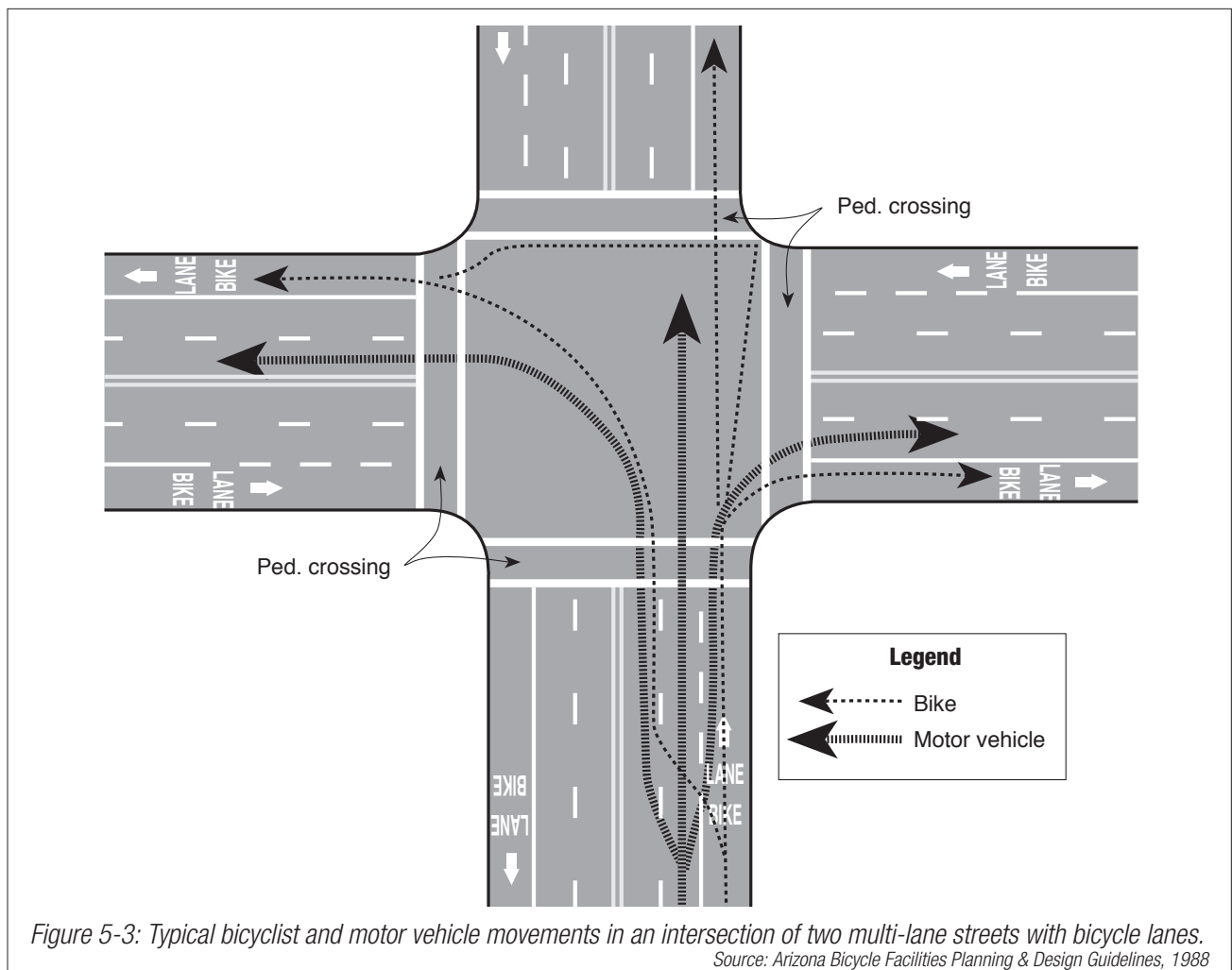


Figure 5-2: Typical bike lane cross sections on two-lane or multi-lane highways.

Source: AASHTO Guide for the Development of Bicycle Facilities, 1991.

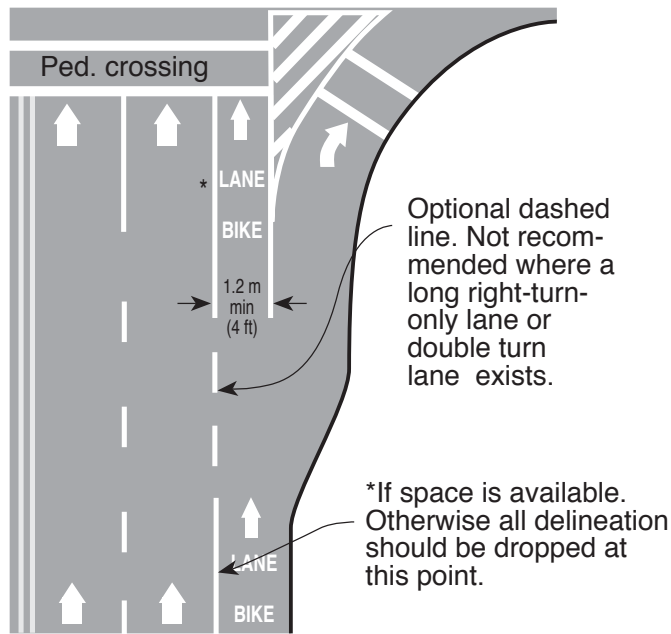


(where the bicyclist proceeds straight through the intersection, dismounts and then walks across the intersection on the cross street).

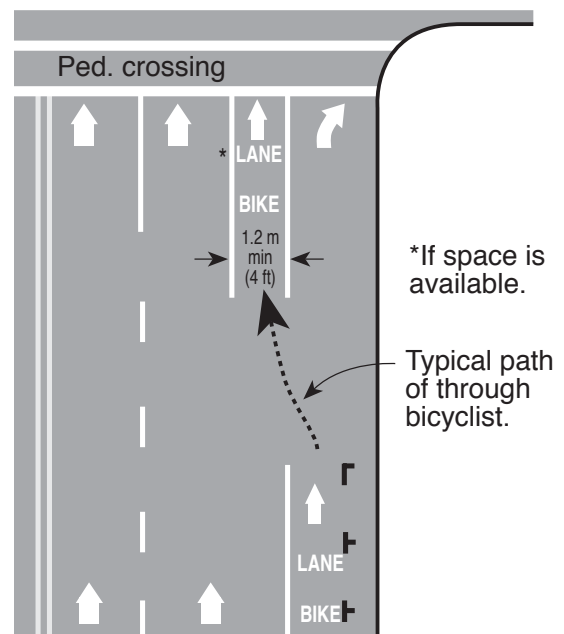
Figure 5-4 illustrates recommended striping patterns for bike lanes crossing a motorist right-turn-only lane. When confronted with such intersections, bicyclists will have to merge with right-turning motorists. Since bicyclists are typically traveling at speeds less than motorists, they should signal and merge where there is a sufficient gap in right-turning traffic, rather than at a predetermined location. For this reason, it is recommended that either all delineation be dropped at the approach of the right-turn lane (or off ramp) or that a single, dashed bike lane line be used, extended at a flat angle across the right-turn lane. A pair of parallel lines (delineating a bike lane crossing) to channel the bike merge is not recommended, as bicyclists

will be encouraged to cross at a predetermined location, rather than where there is a safe gap in right-turning traffic. Also, some bicyclists are apt to assume they have the right-of-way and may not check for right-turning motor vehicle traffic.

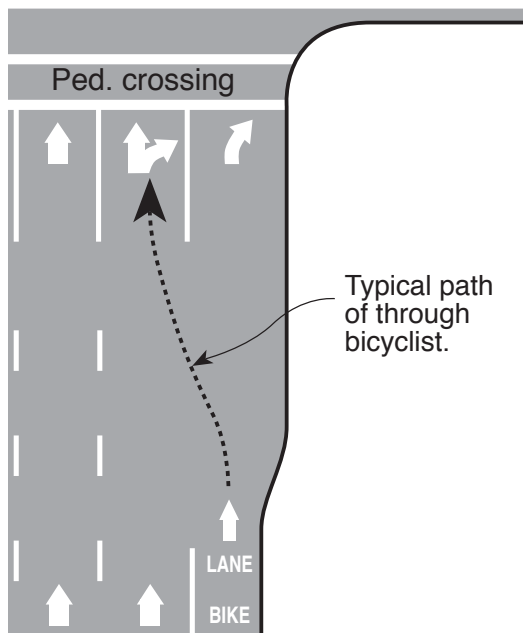
A dashed line across the right-turn-only lane (or off-ramp) is not recommended on extremely long lanes, or where there are double right-turn-only lanes. For these types of intersections, all markings should be dropped to allow the bicyclist's judgment to prevail. Bike lanes crossing on-ramps do not present the same problems, as bicyclists normally have a good view of traffic entering the roadway and will adjust their path as necessary to cross ramp traffic. A "Bike Xing" sign may be used to warn motorists of the potential for bicyclists crossing their path.



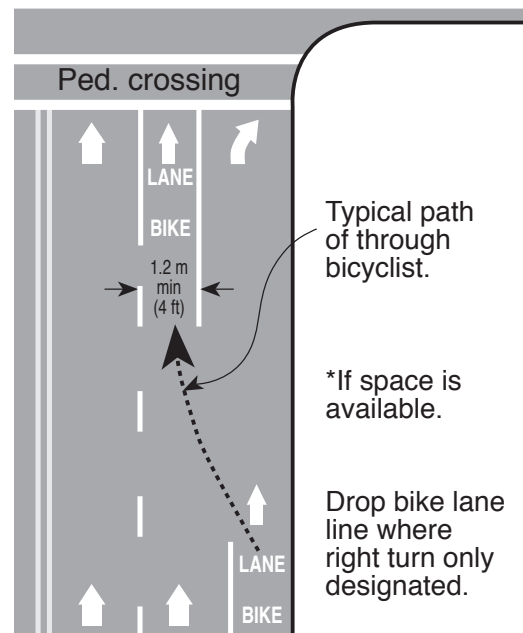
(1) Right-turn-only lane



(2) Parking area becomes right-turn-only lane



(3) Optional double right-turn-only lane



(4) Right lane becomes right-turn-only lane

Figure 5-4: Bicycle lane marking options at intersections with right-turn-only lanes.

Source: AASHTO Guide for the Development of New Bicycle Facilities, 1991.

Where there are numerous left-turning bicyclists, a separate turning lane, as indicated in Part IX of the MUTCD (see Appendix 4), should be considered. The design of bicycle lanes also should include appropriate signing at intersections to reduce the number of conflicts. General guidance for pavement marking of bicycle lanes also is contained in the MUTCD.

